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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/664,681	PSALTIS ET AL.	
	Examiner	Art Unit	
	Christopher R. Lamb	2627	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 June 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 June 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings were received on June 27th, 2007. These drawings are acceptable.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-8 and 10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Regarding claim 1:

The subject matter that is not enabled is "placing a plurality of different carriers of different colors at a single location on a data storage medium to represent data by the presence and absence of said colors."

One of ordinary skill in the art would be unable to perform this method step without undue experimentation.

The specification discloses that the claimed "different carriers of different colors" are quantum dots, which are "nano-scale crystalline structures" (specification: page 10,

line 14). These quantum dots are "approximately 10 nm" in size (specification: page 11, line 7).

The specification proposes three methods of placing these different carriers of different colors: first, using inkjet based technology; second, using holey fibers; and third, using laser induced technology. These three methods correspond to dependent claims 7, 9, and 8, respectively. The specification is not enabling for any of these three proposed methods.

To decide whether the disclosure does not satisfy the enablement requirement, and whether any necessary experimentation is undue, the Examiner has weighed in particular the following factors:

(A) The nature of the invention.

The basic concept has already been discussed, but of particular note is that the specification discloses that "the present invention can increase the storage capability [of a disk drive] by several orders of magnitude. The present invention provides this advantage by multiplying the amount of data that can be stored at each pit" (specification: page 8, lines 7-9). The disclosure later suggests "a storage density of say 1 terabit/square inch," (specification: page 12, lines 7-8), which is enormously larger than current storage capacities.

(B) The state of the prior art.

The Examiner has found no evidence that placing quantum dots at this level of storage density is so well understood or well known that one of ordinary skill would be able to make the invention without more detailed direction from the inventor. The

Applicant cites in the specification several papers, apparently to demonstrate the level of knowledge in the art, but these papers do not teach or suggest any part of the claimed element in question. They are not directed to optical recording at all.

(C) The amount of direction provided by the inventor.

The inventor provides no direction whatsoever. To discuss each of the three methods in turn:

(i) Inkjet based technology.

The Applicant's disclosure of the inkjet based technology consists entirely of a theoretical calculation of the achievable storage density (specification: pages 12-13). The disclosure implies that a standard inkjet nozzle would be sufficient to place these quantum dots (each with an approximate size of 10nm) with such specificity as to achieve a storage density near to or exceeding 1 Tb/in^2, requiring printing on the scale of a commercial disk spot size of 0.32 μm. Considering that this resolution is several orders of magnitude higher than typical inkjet printing, it would appear that more direction would be required to enable this method.

(ii) Holey fibers

The Applicant describes holey fibers (specification: page 13), but does not discuss at all how they could be used to place quantum dots on the medium. Applicant does not have a single drawing depicting holey fibers or their use.

(iii) Laser induced technology

The Applicant references an article by Wenzel et al. that discloses the shaping of nanoparticles. Applicant essentially summarizes the article in the disclosure

(specification: page 14), and then goes on to suggest, in one paragraph, how it could be applied to optical recording (specification: pages 14-15). However, the article does not itself discuss optical recording, and Applicant provides no details as to how to adapt or use the technology in this context.

(D) The existence of working examples.

There are none.

Regarding claims 2-8 and 10:

They are dependent on claim 1. Additionally, claims 7 and 8 are specifically directed to the placing of said carriers.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claim 1-4 and 6 are rejected under 35 U.S.C. 102(e) as being anticipated by Bawendi et al. (US 6,774,361 B2).

Regarding claim 1:

Bawendi discloses:

A method of storing data comprising:

placing a plurality of carriers of different colors at a single location on a data storage medium and representing data by the presence and absence of said colors (column 12, lines 24-65; the item is a data storage medium because the quantum dot barcode contains data; that the quantum dots are different colors is disclosed in, for example, column 10, lines 25-40);

exciting said colors within said carriers by making them fluoresce (column 10, line 40 to column 11, line 10: "an excitation source");

measuring said fluorescence of said carriers to identify presence and absence of said colors (column 10, line 40 to column 11, line 10: "the luminescence from the dots" is the fluorescence).

Regarding claim 2:

In Bawendi the medium is a disk (this is among the possibilities disclosed in column 14, lines 15-50).

Regarding claim 3:

In Bawendi the carriers and nanometer size fluorescent particles (abstract: Bawendi uses the same quantum dots as Applicant).

Regarding claim 4:

In Bawendi the particles comprise quantum dots (abstract).

Regarding claim 6:

In Bawendi said quantum dots are made up of a plurality of shades of a color (there are two ways Bawendi meets this claim. First, in column 6, lines 45-50: Bawendi discloses that there may be as many as 20 "discrete emissions." Since each discrete

emission is a different color, if there are 20 of them there must be a plurality of shades of at least one standard color, since there are only eight of those: i.e., red, yellow, orange, green, blue, indigo, or violet. Alternatively, Bawendi discloses in column 7, lines 15-30, that a given wavelength may have 2-15 different intensities: thus that wavelength will be darker or lighter, or, "shaded").

6. Claims 1, 3, 4, and 6-8 are rejected under 35 U.S.C. 102(e) as being anticipated by McGrew (US 6,692,031).

Regarding claim 1:

McGrew discloses:

A method of storing data comprising:

placing a plurality of carriers of different colors at a single location on a data storage medium and representing data by the presence and absence of said colors (column 5, lines 5-25: "20 or more distinct sizes" corresponds to 20 more more colors);

exciting said colors within said carriers by making them fluoresce (a reader reads the fluorescence signature: column 4, lines 20-35);

measuring said fluorescence of said carriers to identify presence and absence of said colors (again, column 4, lines 20-35).

Regarding claim 3:

In McGrew said carriers are nanometer size fluorescent particles (quantum dots; column 5, lines 5-25).

Regarding claim 4:

In McGrew said particles comprise quantum dots (column 5, lines 5-25).

Regarding claim 6:

In McGrew said quantum dots are made up of a plurality of shades of a color (In column 5, lines 5-35, McGrew discloses there may be 20 or more distinct sizes. Since each distinct size corresponds to a different color, if there are 20 of them there must be a plurality of shades of at least one standard color, since there are only eight of those: i.e., red, yellow, orange, green, blue, indigo, or violet.)

Regarding claim 7:

McGrew discloses wherein said placing of said carriers is performed using inkjet based technology (column 6, lines 10-20).

Regarding claim 8:

McGrew discloses wherein said placing of said carriers is performed using laser-induced technology (column 5, lines 5-35: a laser is used to fix the dots).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bawendi.

Regarding this claim:

Bawendi discloses a method of storing data as discussed above.

Bawendi does not disclose "wherein said quantum dots are made up of a red, blue, and green color."

However, Bawendi does disclose that the quantum dots should be made up of three colors (column 9, lines 25-60: the "three different particle size distributions" correspond to three different colors).

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to include wherein said quantum dots are made up of a red, blue, and green color, because the Examiner takes Official Notice that the standard color space used in computing, displays, and printing is the red/green/blue color space.

The motivation would have been: to pick the colors that make up the standard, for ease in computer processing, displaying, and printing the results.

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over McGrew.

Regarding claim 5:

McGrew discloses a method of storing data as discussed above.

McGrew does not disclose "wherein said quantum dots are made up of a red, blue, and green color."

However, McGrew does disclose wherein there are 20 or more distinct sizes of particles (column 5, lines 5-35). Since each size is a different color, there are thus 20 or more distinct colors of quantum dots.

Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to include wherein some of the quantum dots are red, blue, and green, because with 20 or more colors, it would be obvious to have red, blue, and green among them, as these are standard colors. Furthermore, the Applicant does not disclose that the use of red, blue, or green solves any stated problem or is for any

particular purpose (they are selected only "for purposes of example" on page 8 of the specification), and it appears the invention would perform equally well with any colors.

10. Claim 7 and 8 rejected under 35 U.S.C. 103(a) as being unpatentable over Bawendi in view of McGrew.

Regarding claim 7:

Bawendi discloses a method of storing data as discussed above in the rejection of claim 1.

Bawendi does not disclose wherein "said method of placing said carriers is performed using inkjet based technology."

McGrew discloses that fluorescent ink containing quantum dots can be applied to a carrier by ink jet printing (column 6, lines 10-20). McGrew discloses that this is the preferred method to apply the quantum dots, "because it permits printing variable information in the form of distinct types of quantum dots in different printed dots."

It would have been obvious to one of ordinary skill at the time of the invention to include in Bawendi wherein said method of placing said carriers is performed using inkjet based technology. The motivation would have been as disclosed by McGrew.

Regarding claim 8:

Bawendi discloses a method of storing data as discussed above in the rejection of claim 1.

Bawendi does not disclose wherein "said method of placing said carriers is performed using laser-induced technology."

McGrew discloses a method of placing said carriers (that is, quantum dots) using laser-induced technology (column 5, lines 5-35: it is "laser-induced" because the laser is used to fix the dots in place).

It would have been obvious to one of ordinary skill in the art at the time of the invention to include in Bawendi wherein said method of placing said carriers is performed using laser-induced technology.

The motivation would have been to achieve the storage density disclosed by McGrew (column 5, lines 5-35), which is considerable.

11. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bawendi in view of Metz (US 5,166,813).

Regarding claim 10:

Bawendi discloses a method for storing data as discussed above in the rejection of claim 10.

Bawendi does not disclose "wherein a HSMF is used for dispersing collimated fluorescent light on a spectrally sensitive component." However, note that Bawendi does disperse collimated fluorescent light on a spectrally sensitive component (column 11, lines 10-20: it "spectrally resolve[s] the colors" to a detector).

Note that Applicant defines a HSMF as a "holographic multi-spectral filter" in the specification (page 17).

Metz discloses that when detecting fluorescence, a holographic multi-spectral filter is used for dispersing collimated fluorescent light on a spectrally sensitive component (the abstract discloses the use of a holographic filter; Fig. 1 depicts the light

impacting the spectrally sensitive component; column 12, lines 40-50 discloses that the hologram can be multi-spectral: that is, it transmits more than one wavelength). Metz discloses that a holographic filter is more efficient (column 13, lines 1-15).

It would have been obvious to one of ordinary skill at the time of the invention to include in Bawendi a holographic multi-spectral filter as taught by Metz. The motivation would have been to be more efficient.

12. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over McGrew in view of Metz (US 5,166,813).

Regarding claim 10:

McGrew discloses a method for storing data as discussed above in the rejection of claim 10.

McGrew does not disclose "wherein a HSMF is used for dispersing collimated fluorescent light on a spectrally sensitive component."

Note that Applicant defines a HSMF as a "holographic multi-spectral filter" in the specification (page 17).

Metz discloses that when detecting fluorescence, a holographic multi-spectral filter is used for dispersing collimated fluorescent light on a spectrally sensitive component (the abstract discloses the use of a holographic filter; Fig. 1 depicts the light impacting the spectrally sensitive component; column 12, lines 40-50 discloses that the hologram can be multi-spectral: that is, it transmits more than one wavelength). Metz discloses that a holographic filter is more efficient (column 13, lines 1-15).

It would have been obvious to one of ordinary skill at the time of the invention to include in McGrew a holographic multi-spectral filter as taught by Metz. The motivation would have been to be more efficient.

Response to Arguments

13. Applicant's arguments filed June 27th, 2007, have been fully considered. Each argument will be addressed separately.

14. Applicant's arguments, see pages 6-7, with respect to the rejection of claims 1-8 and 10 under 35 USC 112, first paragraph, have been fully considered but they are not persuasive.

In the specification, Applicant discloses three possible means for placing the quantum dots: inkjet technology, holey fibers, and laser induced technology. Applicant argues that inkjet and laser induced technology are enabled, but makes no argument with respect to holey fibers. Applicant therefore appears to concede the Examiner's position that holey fibers are not enabled by the specification.

With regards to inkjet technology:

Applicant argues that paragraphs 30-32 (here, Applicant is apparently referring to the paragraph numbers of the prepub) and Fig. 2 of the specification discloses a detailed method, down to the number of printheads and the number of drops per second. Applicant further argues that paragraph 21 states that the invention would work with any pit size, and therefore the Examiner's assumptions are incorrect.

However, paragraphs 30-32 do not disclose a detailed method of how to place quantum dots using inkjet technology. Instead, paragraph 31 is a theoretical calculation

as to the number of quantum dots required to reach 1 Tb/in^2. Paragraph 32 discusses the number of printheads required to produce that many quantum dots, but there is no disclosure of the details required to place the dots accurately on the medium. Having a sufficient number of printheads to spray the required number of quantum dots is not sufficient to enable to invention: the quantum dots must be precisely placed in the pits on the disc. Again, since the resolution disclosed in these paragraphs is many, many times higher than commercial inkjet printing, one of ordinary skill would be unable to make the invention without undue experimentation.

Paragraph 21 does state that the recording density would be increased regardless of the size of the pits, but the only pit size disclosed in the invention is the 0.32 μm size disclosed in paragraph 31. Additionally, the entire invention is clearly directed to pit sizes on the order of those in a CD, DVD, etc. See, for example, the abstract: "method and apparatus for increasing data storage capabilities by inserting quantum dots in the pits of disks like CD-RWs, DVDs, WORM disks, and CD-ROM disks." All of these discs have pit sizes that are much smaller than the typical resolution of inkjet printers. Therefore, in its full context, the "size of the pits" referenced in this paragraph is still referring to sizes on the order of those in a CD, DVD, etc., and for any of those sizes the invention does not disclose sufficient detail for one of ordinary skill to make and/or use the invention.

Regarding laser induced technology:

Applicant argues paragraphs 36-38, Figs. 3A and 3B, and the referenced article are sufficient to enable this method.

Paragraphs 36 and 37 describe using a laser to shrink particles embedded in a host material (paragraph 38 leads in to the HMSF description and does not appear to be relevant).

These paragraphs are a basic overview of the sort of technology that could, theoretically, change the size of nanoparticles, but they do not have sufficient detail to enable the claimed subject matter. The mere ability to, in theoretical conditions, change the size of the particle is not sufficient to enable the claimed subject matter. The specification does not disclose any of the details required to store data using the shaped particles: there is no discussion of how the nanoparticles are located or targeted, how some particles in close proximity are affected but not others (since the particles are "at a single location), how the nanoparticles are embedded in a storage medium, etc., etc.

15. Applicant's arguments, see page 7, with respect to the rejection of claims 1 and 2 as anticipated by Glushko have been fully considered and are persuasive. This rejection has been withdrawn.

However, note that claims 1 and 2 remain rejected as anticipated by other prior art as noted above.

16. Applicant's arguments, see page 7, with respect to the rejection of claims 1-4, 6, and 9 as anticipated by Bawendi have been fully considered but they are not persuasive.

Applicant argues that Bawendi is directed toward inventory control and does not disclose storing data on a data storage medium. Applicant argues that Bawendi "only teaches the use of quantum dots as a replacement for bar codes."

However, bar codes contain data. Note, for example, Bawendi column 1, lines 45-65, where it is disclosed that information stored in a bar code is used "as input to a data processing system." A bar code might not contain very much data, but it at the very least contains information about the item that it is attached to.

Therefore, if Bawendi uses quantum dots to form bar codes, Bawendi uses quantum dots to store data on a medium. If data is stored on a medium, it is by definition a data storage medium.

Additionally, note that Bawendi discloses that the quantum dot barcode can encode large amounts of information (column 12, lines 45-55).

17. Applicant's arguments, see page 8, with respect to the rejection of claims 1, 3, 4, and 6-8 as anticipated by McGrew have been fully considered but they are not persuasive.

Applicant argues that McGrew does not disclose a method of storing data on a data storage medium. Applicant agues that the bar codes disclosed by McGrew are only for identification and tacking, and not for storing data.

This argument is similar to the one made against Bawendi above, and is not persuasive for similar reasons: bar codes contain data.

See, for example, McGrew, column 3, lines 5-20, in particular "fluorescence properties of quantum dots are used to provide a means for storing information on a

surface or in a substance, thereby distinguishing valid products or documents from invalid products or documents."

Therefore McGrew's column dots are used for storing data. It may not store a large amount of information, but if it stores any amount of data it is a "data storage medium."

Conclusion

18. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher R. Lamb whose telephone number is (571) 272-5264. The examiner can normally be reached on 9:00 AM to 6:30 PM Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on (571) 272-7589. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

CRL 1/14/08

/William Korzuch/
SPE, Art Unit 2627